

A NOTE ON THE KARYOLOGY OF HAPLOPAPPUS SPINULOSUS (PURSCH) DC. SSP. TYPICUS HALL

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Karyotypic studies and chromosome behaviour at meiosis are important to understand the genetic systems. Though some species of the genus *Haploppus* have been studied in this manner, no such information is available for *Haploppus spinulosus* spp. *typicus* Hall. This is a small perennial Composite which ranges from Alberta to Minnesota and southwards to Texas and as far as Mexico. Several chromosome counts for this species have been recorded (Jackson 1957, 1962; Li and Jackson 1961; Dejong and Longpre 1963; Solbrig et al 1969). All of them, however, are from the southern range of its distribution.

The purpose of this note is to report the karyology of this species from the northernmost part of its distribution.

Seeds were collected from Brooks, Alberta in May 1971. Plants were raised in the greenhouse at the University of Waterloo. Meiotic and mitotic preparations were made following Gill (1971 a, b). Voucher (*L. S. Gill* 353) specimens are preserved in the University of Waterloo herbarium.

One hundred well spread metaphase cells from each of two plants were analyzed. Root tip cells of both plants have 8 chromosomes. One plant has 0-2 B- chromosomes (Figures 5, 6, 7). A haploid chromosome set is shown diagrammatically in Figure 8. The smallest pair of chromosomes has almost median centromeres. Two pairs have submedian centromeres and the longest pair have subterminal centromeres. The smallest pair with the near median centromere is designated as 'A', and the rest as B, C, D respectively with the size increase. The length of Chromosome A is 8.2 microns and D is 13.1 microns. The arm length ratio are A- 0.87, B- 0.54, C- 0.80, and D- 0.15. Chromosome C has a distinct secondary constriction on its short arm. Table 1 presents a few more details.

The relative length and the centromere index are determined following Anderson (1970). The relative length reflects the amount of size homogeneity in each chromosome complement and centromere index shows the degree of terminalization of the centromere.

Table 1

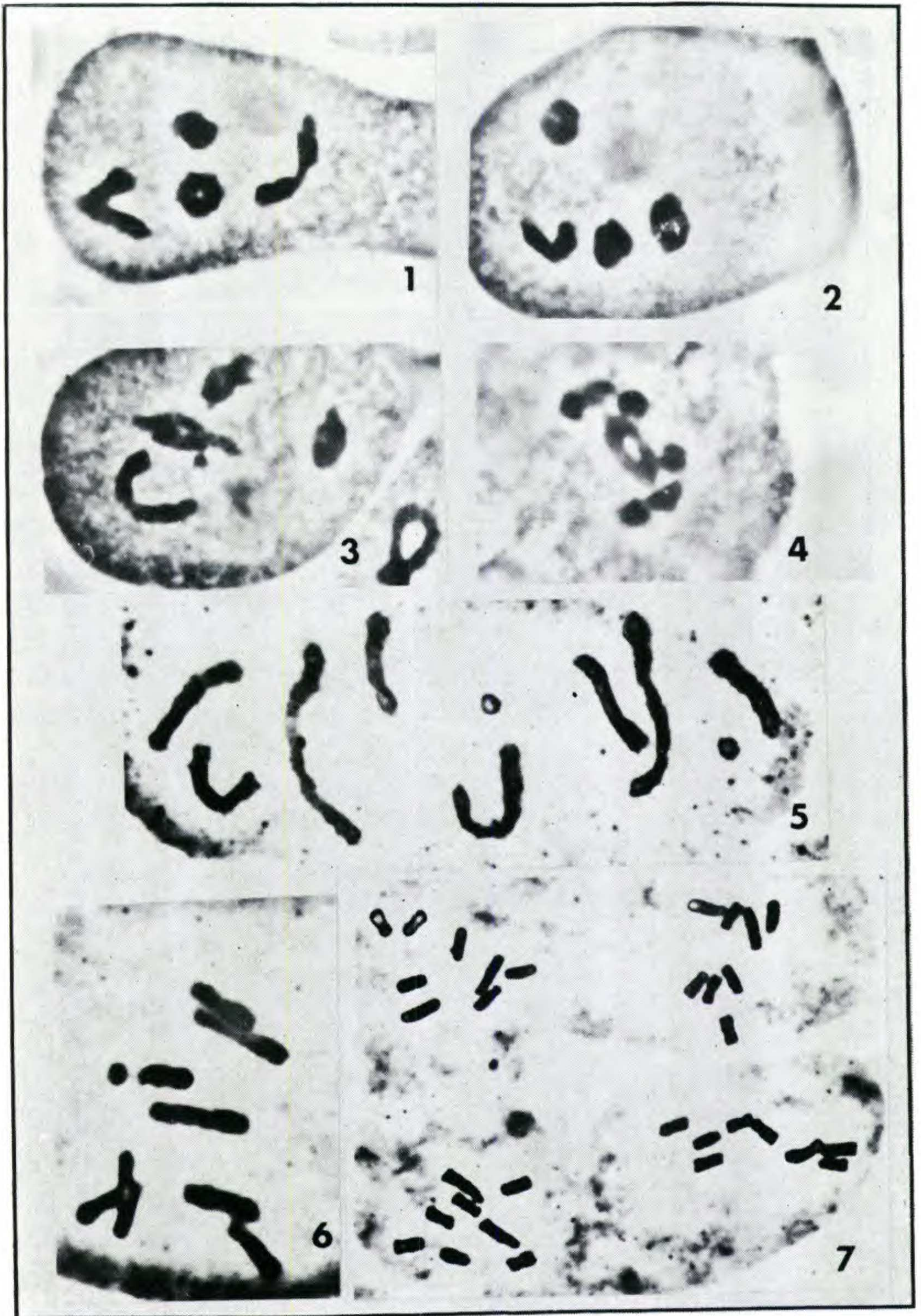
Chromosome morphology of *H. spinulosus* spp. *typica*.

Plant	Absolute chromosome length in microns.		Relative Centromere	
	longest	average	length	index
1	13.2	10.3	0.61	1.63
2	13.1	10.1	0.68	1.65

One hundred meiotic cells in each plant were examined and all had a consistent haploid chromosome number of 4, with no B- chromosomes. The pair of A form a regular ring bivalent, pair of D as a rod bivalent. The other two submedian pairs are seen to form as two rings, but less frequently (Figures 1-4).

Li and Jackson (1961) mention that in *H. spinulosus* spp. *cotula* the smallest two regular chromosomes have an almost median centromere and are about 8.4 microns in length. There are no details mentioned about the other sets. They report the occurrence of differences in B- chromosome number in the cells of roots and flowers. B- chromosome number was not only different between root and shoot, but also existed from cell to cell within the same flower. The elimination of supernumerary chromosomes was not complete in the root as one plant was found to have $2n = 8 + 1$.

In view of the above, it is interesting to note the elimination of supernumerary chromosome in some of the plants of the subspecies *typicus* in its northern part of distribution. Earlier records of chromosome counts for ssp. *typicus* are $n = 4$ (Jackson, 1957), but different counts such as $2n = 8 + 2$, $8 + 3$, $8 + 4$, were reported in ssp. *cotula*



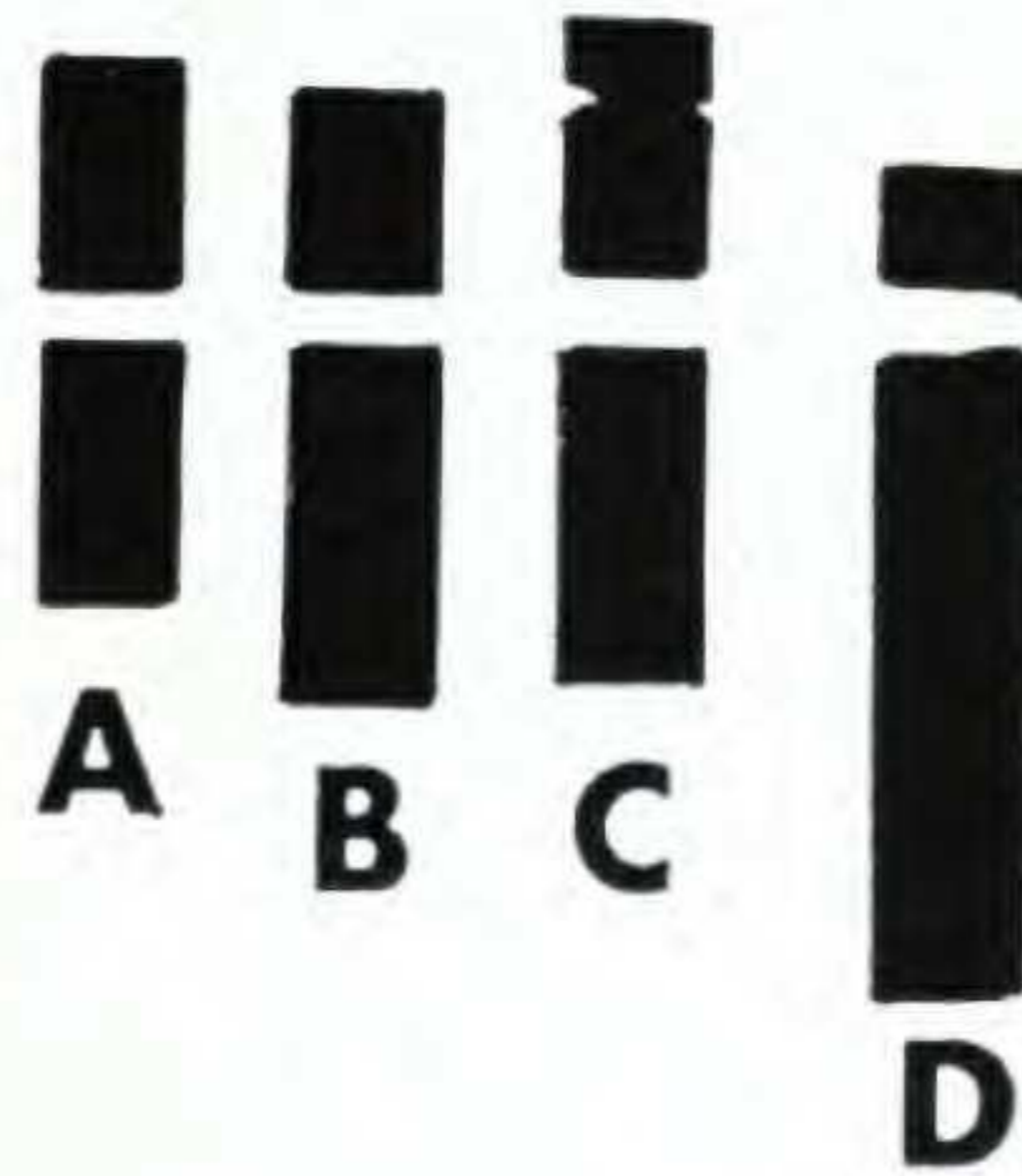


Fig.8

Figure 8. Idiogram of haploid chromosome set for *Haplopappus spinulosus* ssp. *typicus*. \times 4000.

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- Figure 1. Two ring and two rod bivalents at diakinesis. \times 2500.
 Figure 2. Three ring and one rod bivalents in diakinesis. \times 2500.
 Figure 3. Three ring and one rod bivalents in diplotene. \times 2500.
 Figure 4. Late disjunction of one ring bivalent at anaphase one. \times 2500.
 Figure 5. Mitotic metaphase $2n = 8 + 2B$ chromosomes. \times 2500.
 Figure 6. Mitotic metaphase with $2n = 8 + 1B$ chromosome. \times 2500.
 Figure 7. Four mitotic cells with 8 chromosomes in each cell. \times 1000.

(Li and Jackson, 1963). More recently Solbrig *et al.* (1969) reported $n = 8$ for ssp. *spinulosus*, which represents a new ploidy level for this species.

Chromosomal diversity, number and karyology, is evident within the species. A comprehensive study of the species and related ones from their entire range of distribution in North America is being undertaken to understand the evolutionary divergence in this interesting group of species.

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